

## **PROGRAM FOR ARTERIAL SYSTEM SYNCHRONIZATION (PASS)**

### **STANDARD SCOPE OF WORK, SCHEDULE AND BUDGET**

The purpose of the Program for Arterial System Synchronization (PASS) is to provide technical and financial assistance to Bay Area agencies to help improve the safe and efficient operation of certain traffic signal systems and corridors. The primary responsibility for the operation and retiming of traffic signals resides with the agency that owns them.

#### **Scope of Work**

The services to be performed by Consultants will consist of services requested by the MTC Project Manager or a designated representative including, but not limited to, the following:

#### **0. Program Kick-Off**

At the beginning of each annual cycle, Consultants will meet with the MTC Project Manager and other PASS consultants to discuss Program guidelines and standardization of services, deliverable formats, and project administration. Electronic files shall be named in accordance with a naming convention specified by MTC Project Manager.

#### **1. Project Start-Up**

- 1.1 Project Kick-Off Meeting – Consultants will schedule a meeting with the project sponsor, other involved agencies, and the MTC Project Manager or designated representative to kick-off the project; establish communication channels and protocols; discuss the scope of work, schedule, and budget; gather available information; and obtain a thorough understanding of the goals of the project. Specific topics to discuss include the turning movement data collection and times to collect travel time data.
- 1.2 Preparation of a Detailed Workslope, Schedule, and Budget – Consultants will prepare a Detailed Workslope, Schedule, and Budget (DWSB) for review and approval by the project sponsor, other involved agencies, and the MTC Project Manager. Consultants will finalize the DWSB based on comments received from the project sponsor, other involved agencies, and the MTC Project Manager. This deliverable is invoiced after the approval of the Final DWSB.

Deliverable 1A:	Draft Detailed Workslope, Schedule, and Budget
Deliverable 1B:	Final Detailed Workslope, Schedule, and Budget

#### **2. Analysis of Existing Conditions**

Consultants will collect and analyze all information necessary to thoroughly understand existing traffic conditions in the study area and be able to develop optimal time-of-day traffic signal coordination plans and transit signal priority plans, if applicable.

- 2.1 Data Collection – Consultants will collect existing conditions data including, but not limited to, the following:
- 2.1.1. From the project sponsor and other involved agencies, Consultants will collect existing timing sheets, existing coordination plans, traffic signal as-built drawings, aerial photos, maps, and collision diagrams for the study intersections, if available.
  - 2.1.2. From the project sponsor and other involved agencies, including transit properties, if any, Consultants will collect signal timing and signal priority preferences, including, but not limited to, those related to pedestrian and bicycle timing, leading and lagging left-turn phasing, and conditional service, as well as the timing optimization software preference.
  - 2.1.3. Consultants will conduct weekday peak period turning movement counts at all study intersections, including pedestrian and bicycle counts, and seven-day 24-hour machine counts at strategic locations to determine periods of coordination. All counts shall be taken during times and days that are representative of the times and days for which coordination plans will be developed. It is preferred that all counts be summarized in MS Excel format.
  - 2.1.4. Consultants will conduct a field review of all study intersections and street segments to verify lane geometry, speed limits, storage lengths, signal phasing, distances between intersections, and crosswalk lengths, unless the information is available through other sources such as aerial photos and speed surveys. Consultants will conduct a field review at key intersections to measure queue lengths and saturation flows for heavy movements.
  - 2.1.5. Consultants will conduct a field review to observe typical traffic patterns during the weekday peak periods for which coordination plans will be developed. Consultants will note factors that are expected to affect signal progression including, but not limited to: intersections with high pedestrian or bicyclist volumes; over-saturated intersections; uneven lane distribution; high volumes of trucks and buses; high-volume unsignalized intersections, including interchanges; parking maneuvers; and presence and location of bus stops.
  - 2.1.6. Consultants will verify signal coordination and transit priority capabilities of existing equipment and communications infrastructure. Consultants will take digital photos of the controller cabinet and the contents of the controller cabinet, unless waived by the system owner. The digital photos may be taken during timing plan implementation, at the discretion of the Consultants.
  - 2.1.7. Consultants will conduct travel time and delay studies, including number of stops, during times and days that are representative of the times and days for which coordination plans will be developed. A minimum of four runs shall be conducted for each direction for each peak period. Travel time and delay studies shall be

conducted using the floating car method. The time of performance of the travel time and delay studies will be defined at the kick-off meeting.

2.2 Analysis of Existing Conditions – Consultants will analyze the data obtained from Task 2.1 as follows:

2.2.1 As permitted by the project stakeholders, Consultants will review initial and actuated settings for each study intersection to identify opportunities to minimize delay during non-coordination periods and enhance pedestrian and bicyclist safety. The analysis shall include, but not be limited to, review of minimum and maximum green settings; yellow and red times; pedestrian timing; and gap, extension, and reduction settings.

2.2.2 Consultants will review collision diagrams for the study intersections, if available, to identify patterns that are susceptible to correction through signal timing.

2.2.3 Using software specified by the project sponsor, Consultants will develop a model of the study area and calibrate the model based on field observations of existing conditions. Signal coordination optimization software may include, but not be limited to, Synchro, TRANSYT 7-F, or PASSER. Transit signal priority modeling software may include, but not be limited to, VISSIM or Paramics. Consultants will calibrate the model based on travel time and delay studies and field observations of queue lengths and saturation flows for heavy movements at key intersections.

2.2.4 Consultants will summarize the results of the existing conditions analyses in an Existing Conditions Technical Memorandum. At a minimum, the Memo will include: description of the roadway network and surrounding land uses, including a map showing the study intersections; description of traffic volumes, including day-to-day variability and directionality; description of traffic signal controllers and communication capabilities; identification of factors that are expected to affect progression; results of analysis of initial and actuated settings; description of collision patterns that may be susceptible to correction through signal timing; measures of effectiveness, including delay, number of stops, and travel time from the travel time and delay studies, and fuel consumption and emissions using a methodology specified by MTC; and model calibration results, including a summary of changes to the optimization software's default values. Consultants may be required to meet with the project sponsor and other involved agencies to present and discuss the results of the Memo. Consultants will finalize the Memo based on comments received from the project sponsor, other involved agencies, and the MTC Project Manager.

Deliverable 2A:	Draft Existing Conditions Technical Memorandum, including computer model with existing timings
Deliverable 2B:	Final Existing Conditions Technical Memorandum, including computer model with existing timings

### 3. Development of Recommendations

Consultants will develop recommendations of optimal initial and actuated settings; time-of-day coordination plans and hours of coordinated operation; and transit signal priority plans and hours of operation, if applicable. Development of optimal time-of-day coordination plans shall include analyses of signal grouping; phasing and phase sequence, including conditional service; cycle lengths, splits, and offsets. Consultants will summarize recommendations in a Recommendations Technical Memorandum. The Memo shall also include a comparison of existing and proposed timings and a description of expected improvements. Consultants will finalize the Memo based on comments received from the project sponsor, other involved agencies, and the MTC Project Manager.

Deliverable 3A:	Draft Recommendations Technical Memorandum, including computer model with recommended timings
Deliverable 3B:	Final Recommendations Technical Memorandum, including computer model with recommended timings

### 4. Implementation and Evaluation

Consultants will implement and evaluate the approved improvements as follows:

- 4.1 Consultants will prepare for review and approval by the project sponsor and other involved agencies appropriate timing sheets based on the approved timing plans. Consultants will revise the timing sheets based on comments received from the project sponsor and other involved agencies.
- 4.2 Consultants will implement, or assist agency staff in the implementation of, the new settings and timings. Implementation may have to be done in the field or from a central location, depending upon communication capabilities and agency preferences.
- 4.3 Consultants will fine-tune, or assist agency staff in the fine-tuning of, the new settings and timings. Consultants will fine-tune timings in the field and record all changes. Fine-tuning shall be conducted during times and days that are representative of the times and days for which coordination plans were developed. This also requires additional field visits to verify and assess any changes made during the fine-tuning process.
- 4.4 Consultants will conduct travel time and delay studies, including number of stops, at the key corridors identified under Task 2.1.7. Travel time and delay studies shall be conducted during times and days that are representative of the times and days for which coordination plans were developed. A minimum of four runs shall be conducted for each direction for each peak period. Travel time and delay studies shall be conducted using the floating car method.
- 4.5 Consultants will provide to the MTC Project Manager electronic files of all traffic counts, and controller and cabinet information, in a file-naming convention specified by MTC.

- 4.6 Consultants will calculate measures of effectiveness of the improved system, including delay, number of stops, travel time, fuel consumption, emissions, benefit: cost, and cost effectiveness for emissions reductions. The methodology for calculating fuel consumption, emissions, benefit: cost, and cost effectiveness for emissions reductions will be specified by MTC.
- 4.7 Consultants will prepare a Final Timings and Evaluation Technical Memorandum, which will include but not be limited to: the final periods of coordination; changes between the timings recommended under Task 3 and the final timings that were implemented; the number of locations where changes were made to better accommodate pedestrians and/or bicyclists; and the results of the evaluation of measures of effectiveness using the benefit-cost analysis. Various benefits need to be calculated, analyzed and reported in terms of, but not limited to, travel time, delay, speed, emissions, etc.

Deliverable 4A:	Revised Timing Sheets
Deliverable 4B:	Final Timings and Evaluation Technical Memorandum, including final timing sheets with computer model, field review with local jurisdiction, and the Benefit-cost analysis worksheet

## 5. Additional Services

For projects involving transit signal priority, cut-through traffic studies, multiple traffic signal systems, cross-coordination, interconnecting state and local systems, etc., Consultants may be requested to perform services in addition to those described above. Such services may include, but are not limited to: additional meetings, field visits, studies, fine-tuning, procuring and installing GPS clocks, conditional diagrams, updating Visio coversheets when applicable, etc. Should additional services be requested by the MTC Project Manager, Consultants shall include a detailed description of such additional services, a staffing plan, and a man-hour estimate in its DWSB. The scope of these services, as well as the fixed price to be added to the base fee per intersection set forth in the next section will be negotiated on a case-by-case basis. Additional services may also be requested by Consultants after the DWSB has been approved by requesting an amendment to the approved DWSB. If the project requires procuring GPS clocks using the \$10,000 per project communication systems improvement funding under PASS, the Consultants shall procure these clocks and invoice MTC as an additional service. The procedures for the installation of this equipment will be discussed in detail at the project kick-off meetings. The Consultant, if required, will have to procure and install the GPS clocks or other communications equipment as part of the additional services. Installation work can be sub-contracted to other firms or agencies with required licenses and expertise in installing these devices.

## 6. Reduced Services

Consultants may be requested to perform only some of the services above in cases where some services are not part of the PASS project, are already available, or agency staff wishes to perform them themselves. Should reduced services be requested, Consultants shall identify in its DWSB which tasks will be performed by the Consultants and which will be performed by the agency.

The fee shall be reduced as a percentage of the base fee per intersection set forth in the next section that is commensurate with the proportion of services to be performed by the Consultants. Deliverables will be negotiated on a case-by-case basis.

### **Schedule**

<u>Task</u>	<u>Timeline for 2010/2011 Cycle</u>
1. Project Start-Up	
Kick-Off Meetings	July 2010
Detailed Workslope, Schedule, and Budget	August 2010
2. Analysis of Existing Conditions	
Data Collection	September 2010
Analysis	October 2010
3. Recommendations	January 2011
4. Implementation and Evaluation	Implementation by March 2011; Final Report by June 2011.

### **Budget**

#### **Basic Signal Coordination**

MTC will pay Consultants on a fixed fee basis, based on the following fee schedule.

<u>Service (Tasks 0 through 4)</u>	<u>Amount Due</u>
Time-of-day signal coordination with timings implemented remotely from intersection, e.g., via dial-up or from traffic management center	\$2350 per intersection for three scenarios* \$2100 per intersection for two scenarios
Time-of-day signal coordination with timings implemented in the field	\$2550 per intersection for three scenarios \$2300 per intersection for two scenarios

\* Scenarios = morning, off-peak/midday, or afternoon weekday peak period

#### **Additional Services (Task 5)**

MTC recognizes that some projects may require additional services like transit signal priority, interconnecting state and local systems, cut-through traffic studies, multiple traffic signal systems, and cross-coordination, additional fine-tuning, procuring and installing GPS clocks, etc. The budget for the additional services portion of these projects is based on the nature of the technical assistance requested by the project sponsor, and is finalized on a case-by-case basis at the project kick-off meeting. MTC reserves the right to cancel the allocation of the project to the Consultants if a reasonable rate cannot be negotiated for these project specific additional services.

**Basis of Payment**

MTC will pay Consultants for deliverables based tasks based on the following payment schedule. Payment will be authorized after both the project sponsor and the MTC Project Manager have approved the deliverable. The Base Project Budget is the sum of the amounts due under Tasks 0 through 4.

<u>Task</u>	<u>Deliverables (#)</u>	<u>Payment</u>
1.	Draft and Final Detailed Workscope, Schedule and Budget (#1A and #1B)	5% of Base Project Budget
2.	Draft Analysis of Existing Conditions Technical Memorandum (#2A)	35% of Base Project Budget
2.	Final Analysis of Existing Conditions Technical Memorandum (#2B)	10% of Base Project Budget
3.	Draft Recommendations Technical Memorandum (#3A)	15% of Base Project Budget
3.	Final Recommendations Technical Memorandum (#3B )	10% of Base Project Budget
4.	Revised Timing Sheets (#4A)	10% of Base Project Budget
4.	Final Timings and Evaluation Technical Memorandum (#4B)	15% of Base Project Budget
5.	Additional Services or Equipment Purchases	To Be Negotiated